Hi-Rel DC/DC CONVERTER
MGDM-35 : 35W POWER

Hi-Rel Grade

4:1 Wide Input
Single, Bi & Triple Outputs
Metallic Case - 1 500 VDC Isolation

- 28Vdc input compliant with MIL-STD-740A/D/E/F
- Nominal power up to 35 W
- Wide temperature range : -40°C/+105°C case
- High efficiency (typ. 84%)
- Soft start
- Galvanic isolation 1.500 VDC
- Integrated LC input filter
- Permanent short circuit protection
- External synchronisation
- External trim and sense adjustment : +/-5%
- No optocoupler for high reliability
- RoHS or Leaded process option

1-General

The MGDM-35 wide input series is a full family of DC/DC power modules designed for aerospace, military and high-end industrial applications. These modules use a high frequency fixed swiching technic at 250KHz providing excellent reliability, low noise characteristics and high power density. Standard models are available with wide input voltage range of 9-36, and 16-75. The serie includes single, bi and triple output voltage choices of 3.3, 5, 12, 15 volts.
No external heatsink is required for the MGDM-35 series to supply 35W output power over the full temperature range.
All the modules are designed with LC network filters to minimize reflected input current ripple and output voltage ripple .

The modules include a soft-start, an input undervoltage lock-out, a permanent short circuit protection and an output overvoltage protection to ensure efficient module protections. The soft-start allows current limitation and eliminates inrush current during start-up. The short circuit protection completely protects the modules against short-circuits of any duration by a shut-down and restores to normal when the overload is removed.
The design has been carried out with surface mount components and is manufactured in a fully automated process to guarantee high quality. Each module is tested with a GAIA Converter automated test equipment.

4

2-Product Selection

Single output model : MGDS - 35 - [input] – [output] / [option] – [suffix]
Bi output model : MGDB - 35 - [input] – [output] / [option] – [suffix]
Triple output model : MGDT - 35 - [input] – [output] / [option] – [suffix]

Input Voltage Range	Permanent	Transient
H :	9-36 VDC	40 VDC/100 ms
O :	16-75 VDC	80 VDC/100 ms

Output
B : 3.3 VDC
C : 5 VDC or +/-5VDC
E : 12 VDC or +/-12VDC
F : 15 VDC or +/-15VDC
BE : 3.3 VDC and +/- 12 VDC
BF : 3.3 VDC and +/-15 VDC
CE : 5 VDC and +/- 12 VDC
CF : 5 VDC and +/-15 VDC

Options :
/T : option for -55°C start up operating temperature
/S : option for screening and serialization

Suffix :
nothing : RoHS process
-L : leaded process (available in N. America)

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For locations, phone, fax, E-Mail see back cover

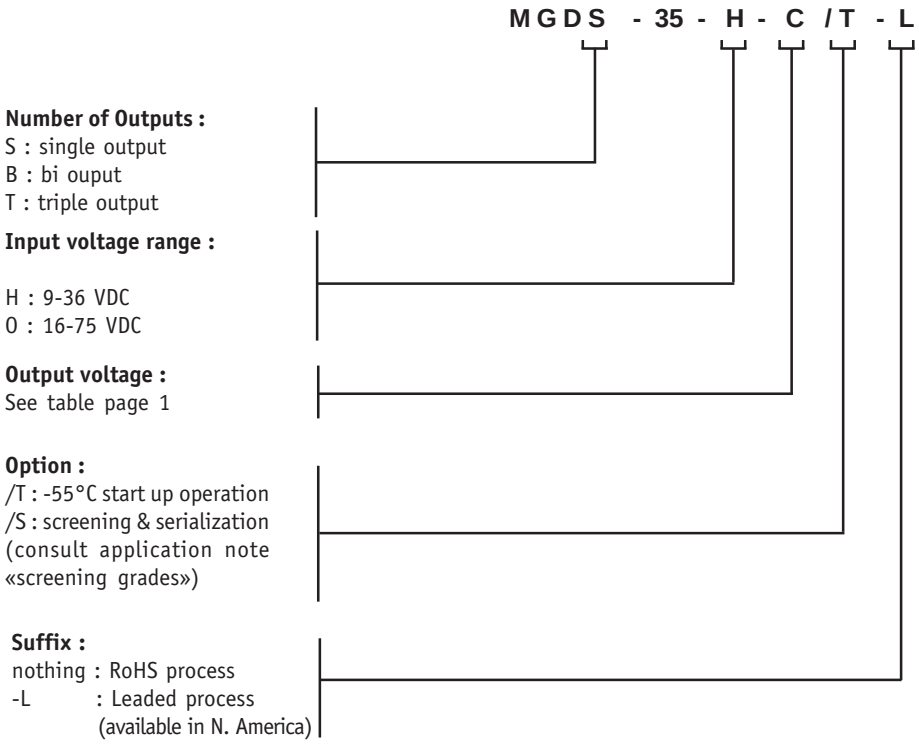
2- Product Selection (continued)

Input range	Output	Current	Reference	Options	Suffix
9-36 VDC	3,3 VDC	7 A	MGDS-35-H-B	/T , /S	-, -L
9-36 VDC	5 VDC	7 A	MGDS-35-H-C	/T , /S	-, -L
9-36 VDC	12 VDC	2,9 A	MGDS-35-H-E	/T , /S	-, -L
9-36 VDC	15 VDC	2,3 A	MGDS-35-H-F	/T , /S	-, -L
9-36 VDC	+/- 5 VDC	+/- 4 A*	MGDB-35-H-C	/T , /S	-, -L
9-36 VDC	+/- 12 VDC	+/- 1,7 A*	MGDB-35-H-E	/T , /S	-, -L
9-36 VDC	+/- 15 VDC	+/- 1,3 A*	MGDB-35-H-F	/T , /S	-, -L
9-36 VDC	3,3 & +/- 11,8 VDC	4 A & +/- 1,1 A*	MGDT-35-H-BE	/T , /S	-, -L
9-36 VDC	3,3 & +/- 15,2 VDC	4 A & +/- 0,9 A*	MGDT-35-H-BF	/T , /S	-, -L
9-36 VDC	5,1 & +/- 11,8 VDC	4 A & +/- 1,1 A*	MGDT-35-H-CE	/T , /S	-, -L
9-36 VDC	5,1 & +/- 14,7 VDC	4 A & +/- 0,9 A*	MGDT-35-H-CF	/T , /S	-, -L
16-75 VDC	3,3 VDC	7 A	MGDS-35-O-B	/T , /S	-, -L
16-75 VDC	5 VDC	7 A	MGDS-35-O-C	/T , /S	-, -L
16-75 VDC	12 VDC	2,9 A	MGDS-35-O-E	/T , /S	-, -L
16-75 VDC	15 VDC	2,3 A	MGDS-35-O-F	/T , /S	-, -L
16-75 VDC	+/- 5 VDC	+/- 4 A*	MGDB-35-O-C	/T , /S	-, -L
16-75 VDC	+/- 12 VDC	+/- 1,7 A*	MGDB-35-O-E	/T , /S	-, -L
16-75 VDC	+/- 15 VDC	+/- 1,3 A*	MGDB-35-O-F	/T , /S	-, -L
16-75 VDC	3,3 & +/- 11,7 VDC	4 A & +/- 1,1 A*	MGDT-35-O-BE	/T , /S	-, -L
16-75 VDC	3,3 & +/- 14,7 VDC	4 A & +/- 0,9 A*	MGDT-35-O-BF	/T , /S	-, -L
16-75 VDC	5,1 & +/- 11,7 VDC	4 A & +/- 1,1 A*	MGDT-35-O-CE	/T , /S	-, -L
16-75 VDC	5,1 & +/- 14,7 VDC	4 A & +/- 0,9 A*	MGDT-35-O-CF	/T , /S	-, -L

** Note : Indicated values are maximum current on each output with total power not exceeding 35W.*

4

Converter Selection Chart


MGDS - 35 - H - C /T - L
Number of Outputs :
S : single output
B : bi ouput
T : triple output
Input voltage range :
H : 9-36 VDC
O : 16-75 VDC
Output voltage :
See table page 1
Option :
/T : -55°C start up operation
/S : screening & serialization
(consult application note «screening grades»)
Suffix :
nothing : RoHS process
-L : Leaded process
(available in N. America)

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3- Electrical Specifications

Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	Single Output MGDS-35	
				35 - H	35 - 0
Input					
Nominal input voltage	Full temperature range	Nominal	VDC	20	28
Permanent input voltage range (Ui)	Full temperature range	Min. - Max.	VDC	9-36	16-75
Transient input voltage	Full load (Consult factory)	Maximum	VDC/S	40/0,1	80/0,1
Undervoltage lock-out (UVLO)	Turn-on voltage Turn-off voltage	Nominal Nominal	VDC VDC	8,8 8	15,8 14
Start up time	Ui nominal within 3 ms Nominal output Full load : resistive	Maximum	ms	30	30
Reflected ripple current	Ui nominal, full load at switching freq. BW = 20MHz	Maximum	mApp	600	600
Input current in short circuit mode (Average)	Ui nominal Short-circuit	Typical	mA	TBD	TBD
No load input power	Ui min. to max. No load or Stanby	Maximum	mW	300	500
Output					
Output voltage	Full temperature range Ui min. to max. 75% load	Nominal Nominal Nominal Nominal	VDC VDC VDC VDC	3,3 5 12 15	3,3 5 12 15
Set Point accuracy	Ambient temperature : +25°c Ui nominal, 75% load	Maximum	%	+/- 2	+/- 2
Output power	Full temperature range Ui min. to max.	Maximum	W	35	35
Output current 3,3V output 5V output 12V output 15V output	Full temperature range Ui min. to max.	Maximum Maximum Maximum Maximum	A A A A	7 7 2,9 2,3	7 7 2,9 2,3
Ripple output voltage * 3,3V and 5V output 12V output 15V output	Ui nominal Full load BW = 20MHz	Maximum Maximum Maximum	mVpp mVpp mVpp	100 200 200	100 200 200
Line regulation	Ui min. to max. 75% load	Maximum	%	+/- 1	+/- 1
Load regulation **	Ui nominal 25% to full load	Maximum	%	+/- 2	+/- 2
Efficiency	Ui nominal Full load	Typical	%	83	84
Maximum admissible Capacitive load 3,3V and 5V output 12V and 15V output	Ui nominal Full load Per output	Maximum Maximum	µF µF	10 000 1 000	10 000 1 000

*Note * : The ripple output voltage is the periodic AC component imposed on the output voltage, an aperiodic and random component (noise) has also to be considered. This noise can be reduced by adding an external capacior (typically 10nF/rated voltage depending on isolation requirement) connected between the pin Gin and the pin Gout of the converter.This capacitor should be layed-out as close as possible from the converter.*
*Note ** : For load regulation characteristics from 0% to full load, please contact factory.*

4

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3- Electrical Specifications (continued)

Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	Bi Output MGDB-35	
				35 - H	35 - 0
Input					
Nominal input voltage	Full temperature range	Nominal	VDC	20	28
Permanent input voltage range (Ui)	Full temperature range	Min. - Max.	VDC	9-36	16-75
Transient input voltage	Full load (Consult factory)	Maximum	VDC/S	40/0,1	80/0,1
Undervoltage lock-out (UVLO)	Turn-on voltage Turn-off voltage	Nominal Nominal	VDC VDC	8,8 8	15,8 14
Start up time	Ui nominal Nominal output Full load : resistive	Maximum	ms	30	30
Reflected ripple current	Ui nominal, full load at switching freq. BW = 20MHz	Maximum	mApp	600	600
Input current in short circuit mode (Average)	Ui nominal Short-circuit	Typical	mA	TBD	TBD
No load input power	Ui min. to max. No load or Stanby	Maximum	mW	300	500
Output					
Output voltage	Full temperature range Ui min. to max. 75% load	Nominal Nominal Nominal	VDC VDC VDC	+/- 5 +/- 12 +/- 15	+/- 5 +/- 12 +/- 15
Set Point accuracy	Ambient temperature : +25°c Ui nominal, 75% load	Maximum	%	+/- 2	+/- 2
Output power *	Full temperature range Ui min. to max.	Maximum	W	+/- 20	+/- 20
Output current * +/- 5V output +/- 12V output +/- 15V output	Full temperature range Ui min. to max.	 Maximum Maximum Maximum	 A A A	 +/- 4 +/- 1,7 +/- 1,3	 +/- 4 +/- 1,7 +/- 1,3
Ripple output voltage ** 5V output 12V output 15V output	Ui nominal Full load BW = 20MHz	 Maximum Maximum Maximum	 mVpp mVpp mVpp	 100 200 200	 100 200 200
Line regulation	Ui min. to max. 75% load	Maximum	%	+/- 1	+/- 1
Load regulation ***	Ui nominal 25% to full load	Maximum	%	+/- 2	+/- 2
Cross load output regulation	Ui nominal + Vout at 75% load - Vout from 25% to full load	Maximum	%	+/- 0,5	+/- 0,5
Efficiency	Ui nominal Full load	Typical	%	84	85
Maximum admissible Capacitive load 5V output 12V and 15V output	Ui nominal Full load Per output	 Maximum Maximum	 µF µF	 1 000 1 000	 1 000 1 000

*Note * : Maximum power per output with total power not exceeding 35W.*
*Note ** : The ripple output voltage is the periodic AC component imposed on the output voltage, an aperiodic and random component (noise) has also to be considered. This noise can be reduced by adding an external capacitor (typically 10nF/rated voltage depending on isolation requirement) connected between the pin Gin and the pin Gout of the converter. This capacitor should be layed-out as close as possible from the converter.*
*Note *** : For load regulation characteristics from 0% to full load, please contact factory.*

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3- Electrical Specifications (continued)

Data are valid at +25°C, unless otherwise specified.

Parameter	Conditions	Limit or typical	Units	Tri Output MGDT-35	
				35 - H	35 - 0
Input					
Nominal input voltage	Full temperature range	Nominal	VDC	20	28
Permanent input voltage range (Ui)	Full temperature range	Min. - Max.	VDC	9-36	16-75
Transient input voltage	Full load	Maximum	VDC/-S	40/0,1	80/0,1
Undervoltage lock-out (UVLO)	Turn-on voltage Turn-off voltage	Nominal Nominal	VDC VDC	8,8 8	15,8 14
Start up time	Ui nominal Nominal output Full load : resistive	Maximum	ms	30	30
Reflected ripple current	Ui nominal, full load at switching freq. BW = 20MHz	Maximum	mApp	600	600
Input current in short circuit mode (Average)	Ui nominal Short-circuit	Typical	mA	TBD	TBD
No load input power	Ui min. to max. No load or Stanby	Maximum	mW	300	500
Output					
Output voltage (1)	Full temperature range Ui min. to max. 75% load	Nominal Nominal Nominal Nominal	VDC VDC VDC VDC	3,3 & +/-11,8 3,3 & +/-15,2 5,1 & +/- 11,8 5,1 & +/- 14,7	3,3 & +/-11,7 3,3 & +/-14,7 5,1 & +/- 11,7 5,1 & +/- 14,7
Set Point accuracy	Ambient temperature : +25°c Ui nominal, 75% load	Maximum	%	+/- 2	+/- 2
Output power *	Full temperature range Ui min. to max.	Maximum	W	20 & +/- 14	20 & +/- 14
Output current * 3,3V & +/- 12V output 3,3V & +/- 15V output 5V & +/- 12V output 5V & +/- 15V output	Full temperature range Ui min. to max.	 Maximum Maximum Maximum Maximum	 A A A A	 4 & +/- 1,1 4 & +/- 0,9 4 & +/- 1,1 4 & +/- 0,9	 4 & +/- 1,1 4 & +/- 0,9 4 & +/- 1,1 4 & +/- 0,9
Ripple output voltage ** 3,3V and 5V output 12V output 15V output	Ui nominal Full load BW = 20MHz	 Maximum Maximum Maximum	 mVpp mVpp mVpp	 100 200 200	 100 200 200
Line regulation	Ui min. to max. 75% oad	Maximum	%	+/- 1	+/- 1
Load regulation ***	Ui nominal 25% to full load	Maximum	%	+/- 2	+/- 2
Cross load output regulation	Ui nominal + Vout at 75% load - Vout from 25% to full load	Maximum	%	+/- 0,5	+/- 0,5
Efficiency	Ui nominal Full load	Typical	%	84	85
Maximum admissible Capacitive load 3,3V and 5V output 12V and 15V output	Ui nominal Full load Per output	 Maximum Maximum	 µF µF	 4 700 470	 4 700 470

Note (1) : The primary voltage should be minimum loaded (consult factory) to be able to get the secondary outputs.
*Note * : Maximum power per output with total power not exceeding 35W.*
*Note ** : The ripple output voltage is the periodic AC component imposed on the output voltage, an aperiodic and random component (noise) has also to be considered. This noise can be reduced by adding an external capacitor (typically 10nF/rated voltage depending on isolation requirement) connected between the pin Gin and the pin Gout of the converter. This capacitor should be layed-out as close as possible from the converter.*
*Note *** : For load regulation characteristics from 0% to full load, please contact factory.*

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3- Electrical Characteristics (continued)

Figure 1 : Typical efficiency versus load at various input

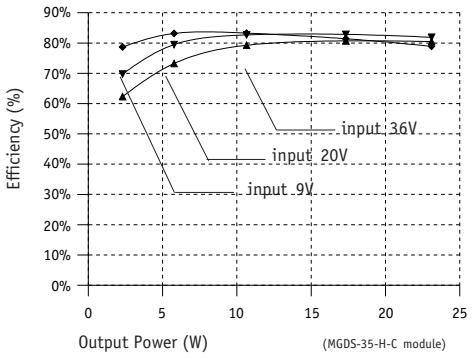


Figure 2 : Typical efficiency versus load at various input

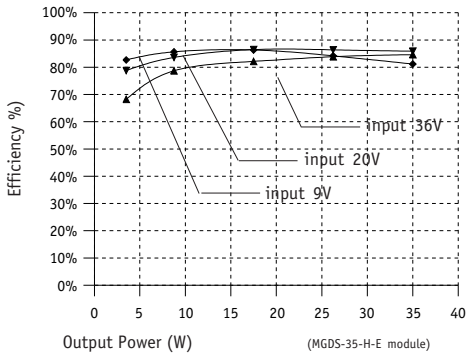


Figure 3 : Typical efficiency versus load at various input

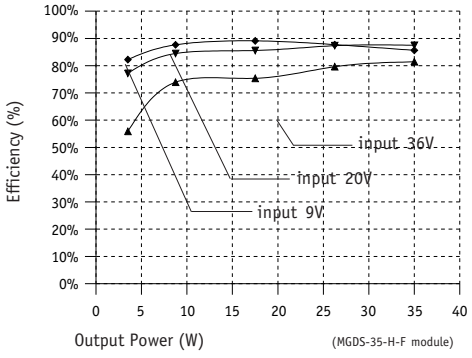


Figure 4 : Typical load regulation characteristics at nominal input

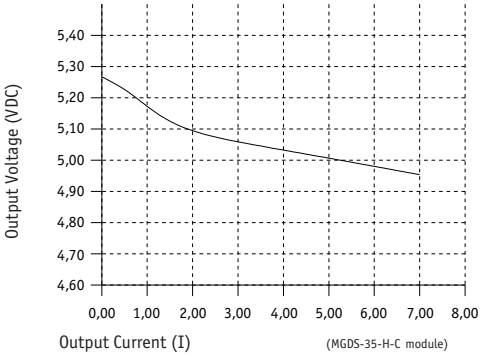


Figure 5 : Typical load regulation characteristics at nominal input

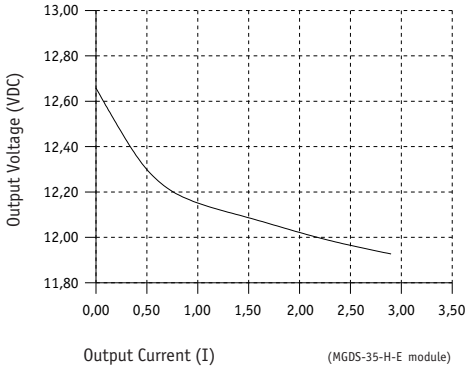
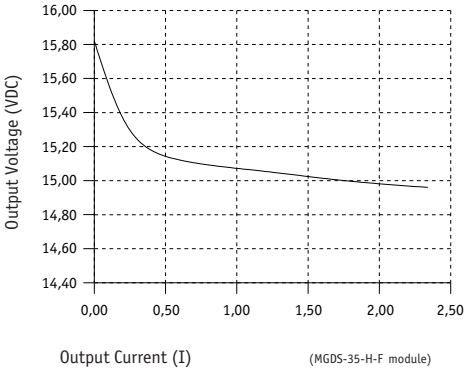


Figure 6 : Typical load regulation characteristics at nominal input



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4- Switching Frequency

Parameter	Conditions	Limit or typical	Specifications
Switching frequency	Full temperature range Ui min. to max. No load to full load	Nominal, fixed	250 KHz

5- Isolation

Parameter	Conditions	Limit or typical	Specifications
Electric strength test voltage (basic version)	Input to output	Minimum	1 500 VDC / 1 min
Electric strength test voltage between outputs (for dual and triple outputs)	Output to output	Minimum	No isolation
Isolation resistance	500 VDC	Minimum	100 MOhm

6- Protection Functions

Characteristics	Protection Device	Recovery	Limit or typical	Specifications
Input undervoltage lock-out (UVLO)	Turn-on, turn-off circuit with hysteresis cycle	Automatic recovery	Turn-on nominal Turn-off nominal	See section 3
Output short circuit protection (SCP)	Hiccup circuitry with auto-recovery	Automatic recovery	Permanent	See section 11
Output overvoltage protection (OVP)	Overvoltage protection device with clamping	Automatic recovery	Nominal	Between 105% and 110% of output voltage

7- Reliability Data

Characteristics	Conditions	Temperature	Specifications
Mean Time Between Failure (MTBF) According to MIL-HDBK-217F	Ground fixed (Gf)	Case at 40°C Case at 85°C	700 000 Hrs 360 000 Hrs
	Airborne, Inhabited, Cargo (AIC)	Case at 40°C Case at 85°C	390 000 Hrs 150 000 Hrs
Mean Time Between Failure (MTBF) According to IEC-62380-TR	Civilian avionics, calculators	Ambient at 55°C 100% time on	980 000 Hrs

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8- Electromagnetic Interference

Electromagnetic Interference requirements according to MIL-STD-461C/D/E standards can be easily achieved as indicated in the following section. The following table resumes the different sections covered by these standards.

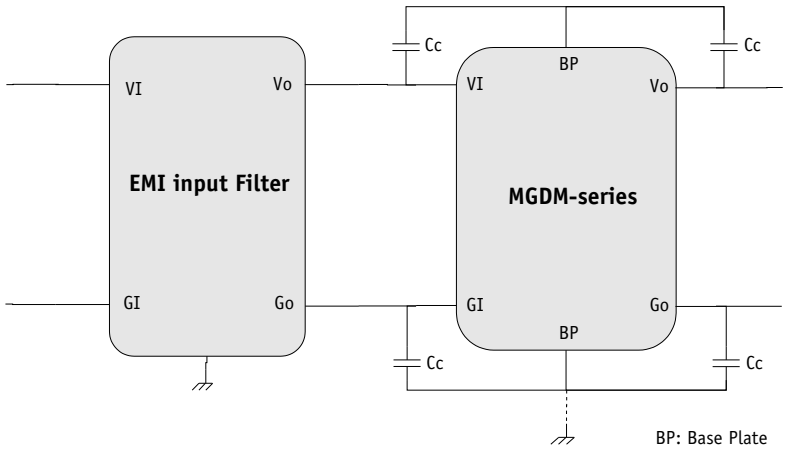
Standard Requirements	MIL-STD-461C Standard	MIL-STD-461D/E Standard	Compliance with GAIA Converter Module & common mode capacitance
Conducted emission (CE) :			
Low frequency	CE 01	CE 101	compliant module stand-alone
High frequency	CE 03	CE 102	compliant with additionnal filter
Conducted susceptibility (CS) :			
Low frequency	CS 01	CS 101	compliant with additionnal filter
High frequency	CS 02	CS114	compliant with additionnal filter
Radiated emission (RE) :			
Magnetic field	RE 01	RE 101	compliant module stand-alone
Electrical field	RE 02	RE 102	compliant module stand-alone
Radiated susceptibility (RS) :			
Magnetic field	RS 01	RS 101	compliant module stand-alone
Electrical field	RS 03	RS 103	compliant module stand-alone

4

8-1 Module Compliance with MIL-STD-461C/D/E Standards

To meet the latest US military standards MIL-STD-461D/E (and also the MIL-STD-461C) requirements and in particular the conducted noise emission CE102 (and also CE03) requirements, Gaïa Converter can propose a stand-alone ready-to-use EMI filter module. This EMI filter module has to be used together with a common mode noise capacitance C_c (10nF/rated voltage depending on isolation requirement) connected between Gin and Gout.

EMI Filter module reference : FGDS-2A-50V.
Please consult EMI filter datasheet for further details.



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9- Thermal Characteristics

Characteristics	Conditions	Limit or typical	Performances
Operating ambient temperature range	Ambient temperature *	Minimum Maximum	- 40°C + 85°C
Operating case temperature range at full load	Case temperature	Minimum Maximum	- 40°C + 105°C
Storage temperature range	Non functionning	Minimum Maximum	- 55°C + 125°C
Thermal resistance	Rth case to ambient in free air natural convection	Typical	6°C /W

*Note * : The upper temperature range depends on configuration, the user must assure a max. case temperature of + 105°C.*

The MGDM-35 series operating **case** temperature must not exceed 105°C. The maximum **ambient** temperature admissible for the DC/DC converter corresponding to the maximum operating case temperature of 105°C depends on the ambient airflow, the mounting/orientation, the cooling features and the power dissipated.

To calculate a maximum admissible ambient temperature the following method can be used. Knowing the maximum case temparature Tcase = 105°C of the module, the power used Pout and the efficiency η :

- determine the power dissipated by the module Pdiss that should be evacuated :

$$\mathbf{Pdiss = Pout(1/\eta - 1)}$$

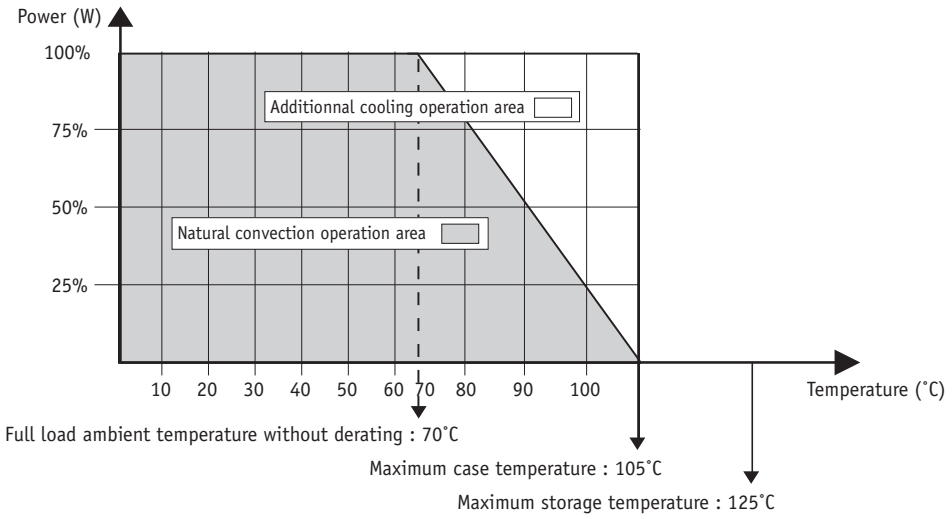
- determine the maximum ambient temperature :

$$\mathbf{Ta = 105°C - Rth \times Pdiss}$$

where **Rth is the thermal resistance from the case to ambient.**

The previous thermal calculation shows two areas of operation :

- a normal operation area in a free natural ambient convection (grey area in this following graph),
- an area with cooling features (air flow or heatsink) ensuring a maximum case temperature below the maximum operating case temperature of 105°C (white area in the following graph).



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10- Environmental Qualifications

The modules have been subjected to the following environmental qualifications.

Characteristics	Conditions	Severity	Test procedure
Climatic Qualifications			
Life at high temperature	Duration Temperature / status of unit	Test D : 1 000 Hrs @ 105°C case, unit operating @ 125°C ambient, unit not operating	MIL-STD-202G Method 108A
Altitude	Altitude level C Duration Climb up Stabilization Status of unit	40 000 ft@-55°C 30 min. 1 000 ft/min to 70 000 ft@-55°C, 30 min. unit operating	MIL-STD-810E Method 500.3
Humidity cyclic	Number of cycle Cycle duration Relative humidity variation Temperature variation Status of unit	10 Cycle I : 24 Hrs 60 % to 88 % 31°C to 41°C unit not operating	MIL-STD-810E Method 507.3
Humidity steady	Damp heat Temperature Duration Status of unit	93 % relative humidity 40°C 56 days unit not operating	MIL-STD-202G Method 103B
Salt atmosphere	Temperature Concentration NaCl Duration Status of unit	35°C 5 % 48 Hrs unit not operating	MIL-STD-810E Method 509.3
Temperature cycling	Number of cycles Temperature change Transfert time Steady state time Status of unit	200 -40°C / +85°C 40 min. 20 min. unit operating	MIL-STD-202A Method 102A
Temperature shock	Number of shocks Temperature change Transfert time Steady state time Status of unit	100 -55°C / +105°C 10 sec. 20 min. unit not operating	MIL-STD-202G Method 107G
Mechanical Qualifications			
Vibration (Sinusoidal)	Number of cycles Frequency / amplitude Frequency / acceleration Duration Status of unit	10 cycles in each axis 10 to 60 Hz / 0.7 mm 60 to 2 000 Hz / 10 g 2h 30 min. per axis unit not operating	MIL-STD-810D Method 514.3
Shock (Half sinus)	Number of shocks Peak acceleration Duration Shock form Status of unit	3 shocks in each axis 100 g 6 ms 1/2 sinusoidal unit not operating	MIL-STD-810D Method 516.3
Bump (Half sinus)	Number of bumps Peak acceleration Duration Status of unit	2 000 bumps in each axis 40 g 6 ms unit not operating	MIL-STD-810D Method 516.3

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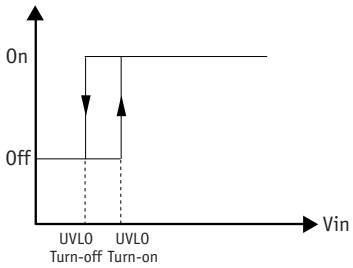
11- Description of Protections

11-1 Input Undervoltage Lock-out (UVLO)

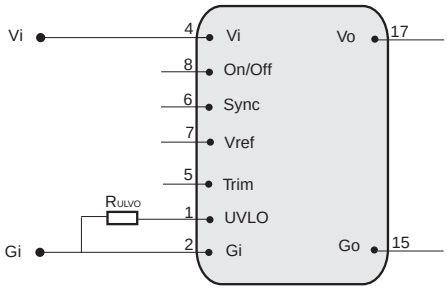
An input undervoltage protection will inhibit the module when input voltage drops below the lock-out turn-off threshold (see section 3 for value) and restores to normal operation automatically when the input voltage rises the lock-out turn-on threshold.



The input undervoltage lock-out threshold (UVLO) can be trimmed by connecting a resistor between UVLO and Gi pins. This resistance can be calculated as folow :

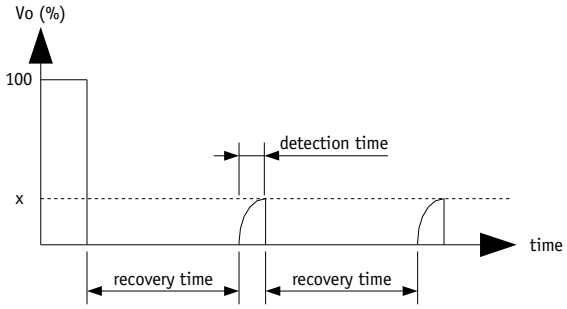
$$R_{UVLO} = \frac{K \times 10^4}{(n - 1)} \qquad \text{where } n = \frac{UVLO_{trim}}{UVLO_{threshold}}$$

	Input H	Input O
K	0,932	1,34



11-2 Output Short Circuit Protection (SCP)

The short circuit protection device protects the module against short circuit of any duration and restores the module to normal operation when the short circuit is removed. It operates in «hiccup» mode by testing periodically if an overload is applied (typically every 1s recovery time). The overload detection threshold is typically 200% of maximum current with a detection time lower than 5ms.



11-3 Output Overvoltage Protection (OVP)

Each circuit has an internal overvoltage protection circuit that monitors the voltage accross the output power terminals.
It is designed to latch the converter off between 105% and 110% of output voltage.
Once in OVP protection, the module will restart automatically when overvoltage is removed.

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12- Description of Functions

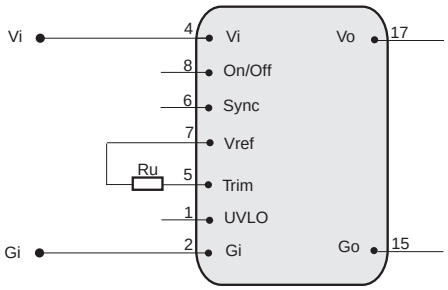
12-1 Trim Function

The output voltage Vo may be trimmed in a range of 95%/ 105% of the nominal output voltage via a single external trimpot or fixed resistor.In case of dual or triple outputs, the trim function is also acting on the secondary outputs.

Trim Up Function

Do not attempt to trim the module higher than 105% of nominal output voltage as the overvoltage protection may occur. Also do not exceed the maximum rated output power when the module is trimmed up.
The trim up resistor must be connected to Vref pin.
The trim up resistance must be calculated with the following formula :

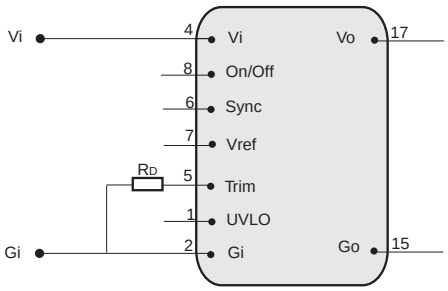
$$R_U = 63 \times 10^3 \frac{(1.095 - \alpha)}{(\alpha - 1)} \quad \text{where} \quad \alpha = \frac{Vo_{trim}}{Vo_{nom}}$$



Trim Down Function

Do not trim down more than 95% of nominal output voltage. The available output power is reduced by the same percentage that output voltage is trimmed down.
The trim down resistor must be connected to Gi pin.
The trim down resistance must be calculated with the following formula :

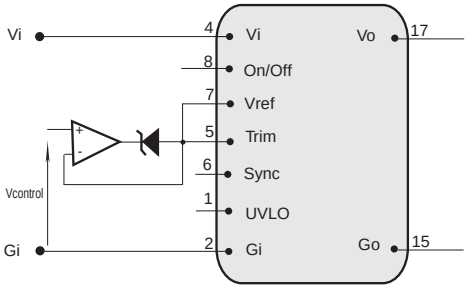
$$R_D = 53 \times 10^3 \frac{(0.887 - \alpha)}{(\alpha - 1)} \quad \text{where} \quad \alpha = \frac{Vo_{trim}}{Vo_{nom}}$$



Trim via a voltage

The output voltage is given by the following formula :

$$Vo = Vo_{nom}(0.0565\ V_{control} + 0.887)$$



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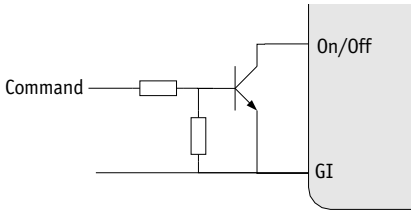
12- Description of Functions (continued)

12-2 On/Off Function

The control pin 8 (On/Off) can be used for applications requiring On/Off operation. This may be done with an open collector transistor, a switch, a relay or an optocoupler. Several converters may be disabled with a single switch by connecting all
On/Off pins together.

- The converter is disabled by pulling low the pin 8.
- No connection or high impedance on pin 8 enables the converter.

By releasing the On/Off function, the converter will restart within the start up time specifications given in table section 3. For further details please consult "Logic On/Off" application note.

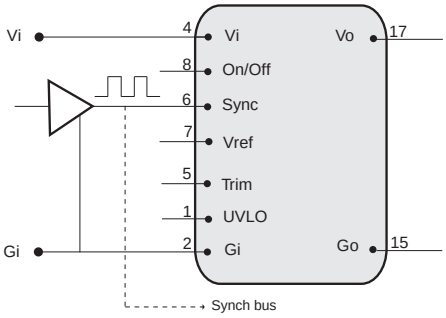


Parameter	Unit	Min.	Typ.	Max.	Notes, conditions
On/Off module enable voltage	Vdc	3	/	4	Open, the switch must not sink more than 100µA
On/Off module disable voltage	Vdc	0	/	1.5	The switch must be able to sink 1mA
On/Off module enable delay	ms	/	/	30	/
On/Off module disable delay	µs	/	/	100	Vin nominal at full load

4

12-3 Synchronization Function

An external clock with rectangular «Pull Up» signals can be used to lock one or more converters. The external clock signal should have a frequency range from 550KHz to 600KHz, a low level below 0,5V a high level of 4V (+/-0.5V), a rise time of 30 ns max. and a drop time of 100ns max.



12-4 Reference function (Vref)

The Vref signal output provides a stable 4V (±0.1 V) reference signal on Vref pin. It is protected by an internal 10 kohms resistor. This signal may be used also in conjunction with the Trim input pin 5 (primary side).

It is recommended to connect a filter capacitor (10nF) between Vref and Gi, if Vref is used.

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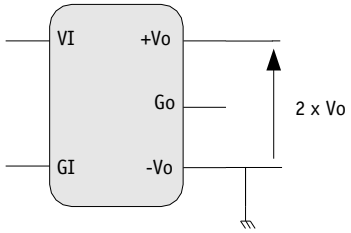
13- Application Notes

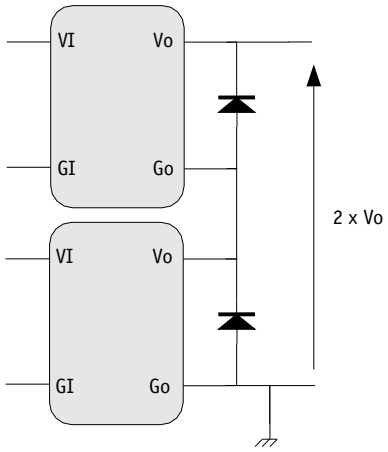
13-1 Connection of Outputs in Series

Any of the bi output converters can be configured to produce an output of 10V (+/-5 output models), 24V (+/-12V output models), or 30V (+/-15V output models) by connecting the load across the output (+) and the output (-) with either output grounded, and leaving the common pin floating.



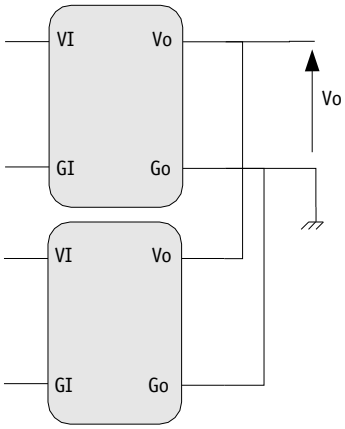
13-2 Connection of Modules in Series

The output of single output units can be connected in series without any precautions to provide higher output voltage level.
Nevertheless, GAIA Converter recommends to protect each individual output by a low power shottky diode rated with the maximum current of the converter to avoid reverse polarity at any output.
Reverse polarity may occur at start up if the output voltages do not rise at the same time.



13-3 Connection of Modules in Parallel

Several converters with equal output voltage can be connected in parallel to increase power. Nevertheless some cares have to be taken in particular as the output voltage of each converter is slightly different, when paralleling, the converter with the highest output voltage will source the most current.



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14- PCB Mounting Specifications

The MGDM-35 series has been design for low profile applications.
Two levels of mounting can be designed :

- On-board mounting with 12,5 mm height
- In-board mounting with 10,5 mm height and PCB hole design on the mother board

Onboard Mounting

Inboard Mounting

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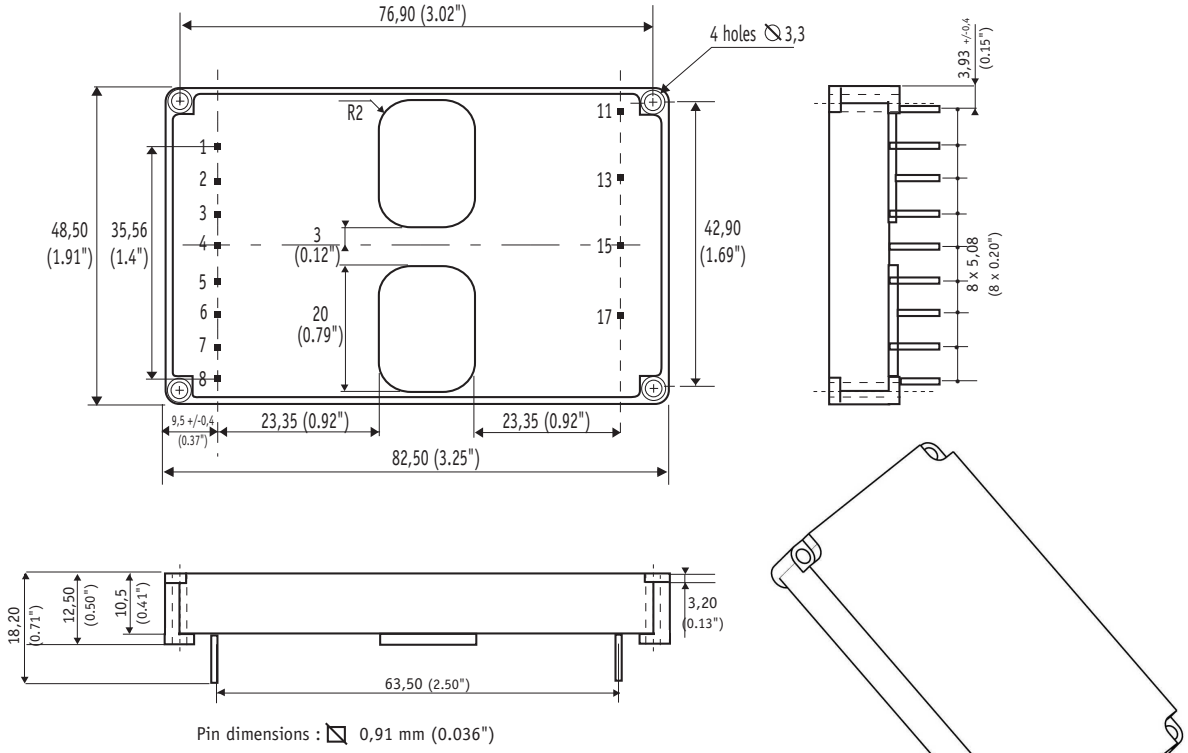
15- Dimensions

Dimension are given in mm (inches). Tolerance : +/- 0,2 mm (+/- 0.01 ") unless otherwise indicated.
Weight : 80 grams (2.80 Ozs) max.



Pin dimensions : ⌀ 0,91 mm (0.036")

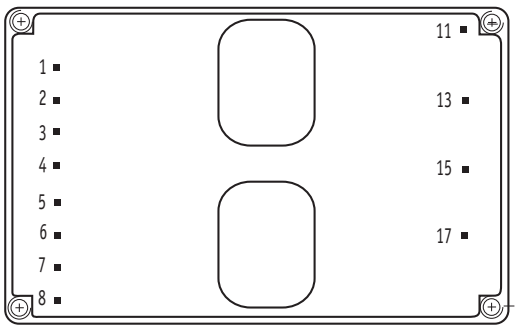
16- Materials

Case : Metallic black anodized coating.
Pins : Plated with pure matte tin over nickel underplate.

17- Product Marking

Upper face : Company logo, location of manufacturing.
Side face : Module reference : MGDx-35-»X»-»Y».
Date code : year and week of manufacturing, suffix, /option.

18- Connections



Bottom view

Pin	Single	Bi	Triple
1	UVLO	UVLO	UVLO
2	- Input (Gi)	- Input (Gi)	- Input (Gi)
3	Do not connect	Do not connect	Do not connect
4	+ Input (Vi)	+ Input (Vi)	+ Input (Vi)
5	Trim	Trim	Trim
6	Synchro (Sync)	Synchro (Sync)	Synchro (Sync)
7	Vref	Vref	Vref
8	On / Off	On / Off	On / Off
11	Do not connect	Output - (-Vo)	Output 2- (-V2)
13	Do not connect	Do not connect	Output 2+ (+V2)
15	Common (Go)	Common (Go)	Common (Go)
17	Output (Vo)	Output + (+Vo)	Output 1 (V1)

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